Frequency and Timing

• Overall Objective

– To advance the technologies for generation and transmission of ultra-stable reference signals *and* to perform in-situ calibration of atmospheric phase delay for Ka-band propagation to deep space receivers. These tasks will be carried out to reduce DSN costs and enable new mission types.

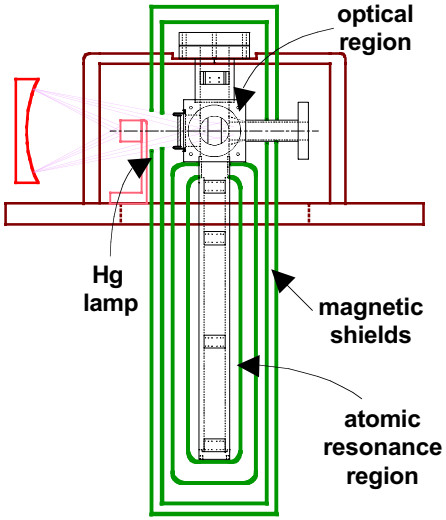
• Goals and Products

– Design and fabricate 1 L volume multi-pole LITE physics package with 10^{-14} long-term instability for deep space 1-way navigation.

– Demonstrate 40 K Compensated Sapphire Oscillator (CSO) to provide 10^{-14} short-term instability (1 s to 100 s) with uninterrupted operation.

– Develop 32 GHz optoelectronic oscillator with -32 dBc/Hz phase noise at 1 Hz from the carrier for s/c Ka-band communications links.

– Develop a tropospheric calibration system based on the water vapor radiometer (WVR) to reduce deep-space Ka-band link noise to below 1.6×10^{-15} to meet Cassini Radio Science requirements.



Hg Ion Frequency Standard

Advanced Water Vapor Radiometer